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ABSTRACT

Twenty male and female students from a high school psychology class participated in a formative evaluation of student acceptance and performance with the Primary Instruction Logic of the TICCIT delivery system. A secondary goal was a pilot effort to design a carrel that would optimize certain parameters of the physical/environmental conditions affecting TICCIT users. After receiving instructions and terminal training from an evaluator, each student completed two segments from a freshman English course designed on TICCIT. Each student then completed a questionnaire while an evaluator completed a subjective observation checklist on the student. Results indicated that students accepted and were intrigued by the Primary Instruction Logic of TICCIT, and were able to learn how to operate the keyboard, learn the material, and enjoy the experience. They seemed to enjoy developing their own strategies for manipulating the instruction, but expected guidance for making strategy decisions and training on the use of the keyboard. Further studies on lighting, spatial relations, noise, and color are needed in designing the carrel for the TICCIT terminal. Appendices include (1) the subjective observation checklist, (2) the student questionnaire, (3) instructions for terminal operation, and (4) a summary of control key operation. (CHV)

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STUDENT ACCEPTANCE OF THE TICCIT SYSTEM: A PRELIMINARY STUDY

Calvin S. Asay
Edward W. Schneider

ICUE Technical Report No. 3

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Brigham Young University
Provo, Utah

IR006173

STUDENT ACCEPTANCE OF THE TICCIT SYSTEM: A PRELIMINARY STUDY

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Brigham Young University

INTRODUCTION

Efforts have been made in a survey of the literature to find relevant information about factors affecting, and factors that will affect, the TICCIT terminal. Little has been found because of the unique nature of the TICCIT approach. In this case, information is generated in the process of building the system. In this process, formative evaluation must play an important role in modifying the system according to users' needs.

This evaluation was designed and carried out to examine the TICCIT delivery system. Its purpose was to ascertain student acceptance of the Primary Instruction Logic and to find out if the students could learn to operate the system. A secondary goal was a pilot effort to design a carrel that would optimize certain parameters of the physical/environmental conditions affecting TICCIT users.

The interim five-terminal TICCIT system, delivered by MITRE to BYU at the beginning of April, 1973, provided the "bare-bones" of the fully operative TICCIT system. Four lesson segments were implemented: E.2.4.8, E.2.4.9, M.2.2.5 and M.2.2.6. These segments teach aspects of paragraph composition

and forms of linear equations. Using this material, we have gleaned some initial reactions from potential users.

METHOD

Subjects

Twenty subjects (Ss), ten men and ten women from a high school psychology class, participated in the evaluation. Of these twenty subjects, 55 percent intended on going to a four-year college after graduation, 20 percent planned on going to a technical school, 5 percent to a junior college, and 15 percent to other places. They were payed at the rate of $2 per hour. The average amount earned was $2.27.

Apparatus

Four TICCIT terminals, consisting of TV display and a keyboard, were arranged on tables so that the Ss could sit on a chair and operate the terminals comfortably. The room used was approximately 20 by 40 feet with overhead fluorescent lighting and air conditioning. Because certain computer functions were not yet operative, three people assisted the evaluator in such functions as simulating the answering process of the computer and helping when appropriate. To help in the evaluation of the data, a subjective observation checklist was constructed (see Appendix 1). Data was collected on a questionnaire constructed for this specific purpose (see Appendix 2). A set of instructions was also constructed (see Appendix 3). To facilitate operation of the control keys, a summary sheet of control key operations was constructed (see Appendix 4).

Procedure

The Ss arrived at the terminal room four at a time as previously scheduled. At this time, each S was randomly seated at one of the four terminals. The evaluator read the instructions. Questions were handled as best as possible. The Ss were then instructed to begin operation of the terminal with the evaluator or one of the assistants sitting beside each S. The evaluator and the assistants answered the practice questions as the computer eventually will for the S. They also helped the Ss when they needed help. The Ss went through two English segments from the freshman English course. The first segment, E.2.4.9, dealt with writing purpose statements. The second segment, E.2.4.8, dealt with writing lists of specifics. Upon completion of the two segments, the Ss were then ushered out of the room to another room to answer the questionnaire. At this time, the evaluator and assistants completed the observation checklist for each S. Upon completion of the questionnaire, the Ss were free to leave.

Results and Discussion

On rating scales, a mean and standard deviation were computed on a bipolar scale from +1 to -1. For true/false questions, percentages were computed. For rankings, a mean was calculated. For multiple alternative questions, percentages were computed (see attached figures).

Overall indications were that the students enjoyed the experience and that there is acceptance on their part for such a system for part of their education (see Figures 5 through 19).

Question 1 (Figure 5) indicates students enjoyed the TICCIT instruction as compared to other types of instruction. With a mean of 0.57 and a standard deviation of 0.15 there appears to be a fair unanimity.

Question 2 (Figure 6) shows positive preference for taking an English course from TICCIT, while it also shows ambivalence about taking a math course. This may have been influenced by the fact that only English segments were used. Also, it may reflect a possible general trend in the population to prefer English to math (English: 70% yes; Math: 35% yes).

Question 3 (Figure 7) indicates most people felt they would be willing to work at a terminal for thirty minutes to an hour in one sitting. This seems possibly to reflect the fifty-minute periods most students are used to sitting in classrooms. Better guidelines will be available when the system is operational and the actual time students spend at the terminals is recorded (15 minutes: 5%; 30 minutes: 35%; 45 minutes: 10%; 60 minutes: 50%).

Question 4 (Figure 8) indicates that students were able to understand the subject matter to a positive degree in the short time they had to learn it. This question determines if the students were really in a learning mode during this acceptance evaluation. It indicates students felt they had learned from the TICCIT system (mean: 0.32; standard deviation: 0.10).

Question 5 (Figure 9) indicates most people felt the TICCIT instruction tended toward individual study; however, the standard deviation of 0.32 indicates that there were fairly diverse opinions. Possibly this result was influenced by lack of understanding of how the TICCIT system will be used. The experimenters

would have predicted a higher tendency to relate TICCIT to individual study. Possibly the results were also biased by the presence and help of the evaluators (mean: 0.27; standard deviation: 0.32).

Question 6 (Figure 10) indicates that the students like lecture least and discussion most. Computerized instruction was the second most well-liked method of instruction. It seems probable that computerized instruction, instruction by private tutor, and individual study were not very familiar to the students and were not well understood for ranking purposes (means: discussion - 1.53; computerized instruction - 2.63; individual study - 3.18; private tutor - 3.19; lecture - 4.29).

Question 7 (Figure 11) indicates that students were able to operate the terminal well. They were very well agreed how far that ability extended (mean: 0.41; standard deviation: 0.06).

Question 8 contains several conclusions on the keyboard.

(1) There appears to be a large question on whether or not the keys are well spaced. This may be influenced by the fact that many students didn't know how to type (see Figure 12).

(2) Complete agreement that the labels on the buttons on the keyboard had relationship to what was done when they were pushed (see Figure 13).

(3) All agreed they remembered the instructions on how to use the buttons and punched accordingly (see Figure 14).

(4) Near agreement that pressing the buttons was not overly complex (see Figure 15).

(5) Near agreement that the students wanted and felt it useful to have an orientation on the use of the keys (see Figure 16).

(6) A substantial percentage indicated that the explanation of the use of the keys could or should be improved, although most felt it was adequate (see Figure 17).

(7) A large percentage indicated they enjoyed being able to order and modify their instruction (see Figure 18).

(8) A substantial percentage indicated that having only rule, example, and practice was too constraining. This seems to indicate that they would like more options to instruction modification; however, most felt satisfied with the three means of instructional modification (see Figure 19).

Questions 9 through 17 were asked for the purpose of gaining preliminary insight for a TICCIT carrel design. Generally, it was found that the questions will have to be refined and control situations established in order to determine significant results (see Figures 20 through 30).

Question 9 indicates that extraneous noise (i.e., TV flyback, air conditioning, etc.) is not a critical problem. However, the standard deviation suggests that there were wide individual differences as to the bothersome effects. It would seem to indicate a necessity for tighter control of the noise environment for proper statistical comparisons. Different kinds and degrees of noise and personality variables would be used (mean: 0.28; standard deviation: 0.33).

Question 10 indicates the students felt the room lighting was about right to just a little too bright. The overhead fluorescent lighting with the

overhead light banks turned off seemed to work well (mean: 0.08; standard deviation: 0.10).

Question 11 indicates a general lack of bothersome glare and reflection. There was a fairly wide opinion on this subject as indicated by the standard deviation (mean: 0.55; standard deviation: 0.26).

Question 12 indicates that little glare and reflection was noticed on the screen, whether or not it was bothersome. There was an even wider range on the amount of glare and reflection noticed than the range of those that were bothered. Glare and reflection (especially reflections of moving objects) needs to be studied more carefully in the design of the carrel (mean: 0.35; standard deviation: 0.38).

Question 13 indicates a general agreement that the material was readable from the TV screen, with a wide range of individual opinion. Readability most probably interacts with such variables as room lighting, distance from the TV, height of TV, brightness of the screen, and color, as well as individual physiological and psychological differences, definition of the image on the screen, and instructional content.

Question 14 indicates that the brightness of the image on the screen was about what the students wanted, perhaps just a little too bright. There was very good agreement on this subject (mean: 0.13; standard deviation: 0.06).

Question 15 indicates the students (1) thought the use of color was very helpful. Perhaps they interpreted helpful in the question to mean desirable, but at any rate there was good agreement that they liked it. Perhaps some

considerations will have to be made for color blindness if, in some cases, color coding is the sole conveyor of information (mean: 0.65; standard deviation: 0.09). (2) Also, students felt color helped in promoting readability, although this feeling was not as strong as the color preferences indicated in part (2). There was a fairly wide range of opinion on the subject (mean: 0.41; standard deviation: 0.26).

Question 16 indicates that students generally liked blue and green the best and black and white the least. It is hard to know if students ranked the colors according to preconceived preference or from readability on the screen (means: blue and green - 2.67; red - 2.83; yellow - 3.06; cyan - 3.62; white - 4.11; black - 4.80).

Question 17 indicates several things about spacial arrangement of the TV and the keyboard. (1) There was a general, and well-agreed, feeling that the TVs were at the right distance, with the slightest tendency to feel they were too low. This may reflect a familiarity with household TV sets being at a certain distance and to personality variables of what people do when they begin to concentrate on a task. The central tendency may also reflect a general lack of thought about the subject. Possibly they should each receive different conditions to have something to compare against (mean: -0.06; standard deviation: 0.06).

(2) The students felt the TV sets were about the right height to just a little low. There was a great deal of unanimity on the subject. This may also be due to the considerations listed in part (1) (mean: -0.14; standard deviation: 0.08).

(3) Students felt that the keyboard was about right to just a little low. There was fairly good agreement on the subject. This result again may be due

to the considerations made in part (1) (mean: -0.09; standard deviation: 0.11).

Questions 18 through 20 were to determine personal characteristics of the subjects.

Question 18 indicates that the majority of the students had no visual problems (70% - none; 25% - nearsighted; 5% - farsighted).

Question 19 indicates the degree of color blindness found in a normal population (90% - none; 10% - red-green; 0% - blue-yellow). Since there were only two people who were color blind, enough information could not be obtained to recognize a trend. One had trouble recognizing the color coding, the other didn't.

The results of Question 20 were reported above, in the "Subject" section.

Question 21 allowed students to make comments, constructive or otherwise, positive or negative. In categorizing the comments by the thoughts they contained, we judged that there were approximately two positive comments to one negative comment (34 positive, 18 negative). Half of the negative comments were not really a condemnation of the system; rather, they were suggestions for change or improvement. Putting the suggestions aside, there are about four or five positive comments to one negative comment. Generally, factors of individualized learner control were singled out as the things the students liked, while the possible elimination of social interaction, fear of not having regular incentives to do their studies, and wearing off of the novelty

effect were singled out as factors contributing to dislike for the system. Some improvements could be made, according to the students, in the instructions and explanation of what was going on, and certain factors such as the legibility of red and black colors are candidates for possible improvement. Figure 1 contains a tabulation of the comments.

Table 1
Positive Categories

	Tally
Positive Expressions (i.e., "I liked it." "I'd take it rather than a teacher any day.")	15
Specifics (Why liked)	
Liked colors designating right and wrong answers	1
Individual help	1
Educational	2
Own speed	1
Can go back and review	2
Examples were helpful	1
A change	1
Easier	1
Enjoyable	1
Learn well	1
Faster	1
Other positive but extraneous comments (i.e., Instructions were explained well.)	6

Table 2
Negative Categories

	Tally
Negative Expressions	
(i.e., "I would never use it.")	3
Specifics (Why didn't like it)	
Confusing	1
Shouldn't replace teachers	1
Need association with fellow students	1
Wouldn't attend to lessons regularly	1
Boredom	2
Constructive Comments	
TV needs better focusing	1
Black print hard to read	1
Black print was boring to read	1
Red was hard to read	2
Explain the system better	1
Explain what being asked of students better	1
Don't make questions personal opinion	1
Have more practices	1

Observation Checklist Results

The following results were compiled from the checklists that the evaluator and assistants filled out on each student. It is our general impression that there was nothing unusual or different about this group from a normal population. It seemed logical that high school seniors would be a not-too-far-different population from a junior college population.

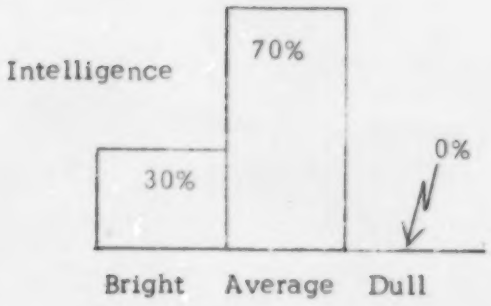


Figure 1

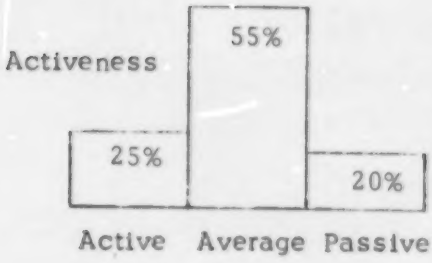


Figure 2

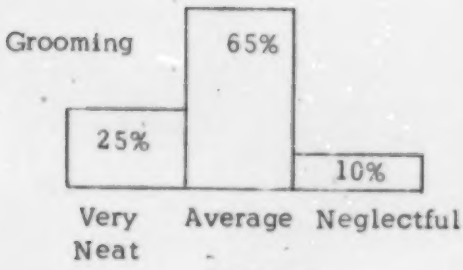


Figure 3

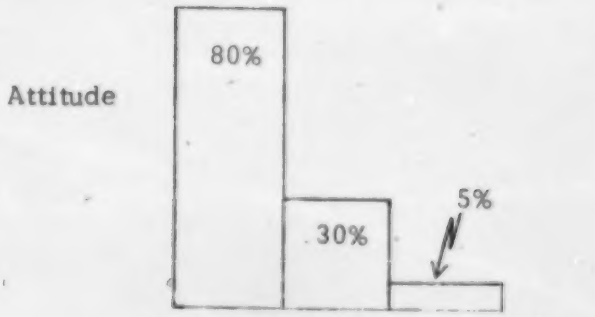


Figure 4

(The various adjectives under attitude were marked independently of each other. Percentages for each one are the percentage out of 20. Information for positive and negative adjectives were not recorded.)

Summary

The evaluation results appear to give evidence that students will accept Primary Instruction Logic and that most are quite intrigued by it. The high school students were able to learn how to operate the keyboard, learn the material and

enjoy the experience, wanting more of the same. It appears students enjoy developing their own strategies for manipulating the instruction, but they insist on orientation for making those strategy decisions and training on the use of the keyboard. Because students indicated that they like discussion best as a method of instruction, coupled with some comments made on Question 21, it seems that students may perceive TICCIT as eliminating social interaction and discussion. Some students also expressed concern that the "newness" may wear off and that they may not be motivated to study on a regular basis. Also, some consideration should be given to other ways of manipulating the instructional material, although the rule, example, and practice sufficed for most students. Preliminarily, most students felt they would like to be at a terminal between one-half hour to one hour in one sitting. These seem to be the most important considerations regarding student acceptance.

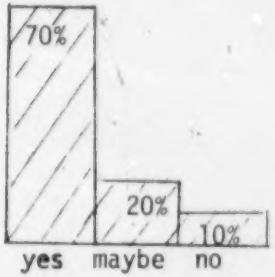
It also appears that many of the spatial and environmental conditions remain to be investigated again with refined tools and appropriate conditions. Specifically, using this evaluation as a preliminary step, further strides on lighting, spatial relations, noise, and color can be expanded for use in designing the carrel for the TICCIT terminal.

1. Did you enjoy this experience compared to other types of instruction?

Figure 5

2. From what you've seen of the terminal and the course, would you care to take an entire course this way?

An English course?



A Math course?

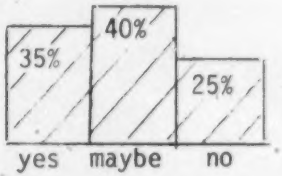


Figure 6

3. On the average how long do you think you would like to be at a terminal in one sitting?

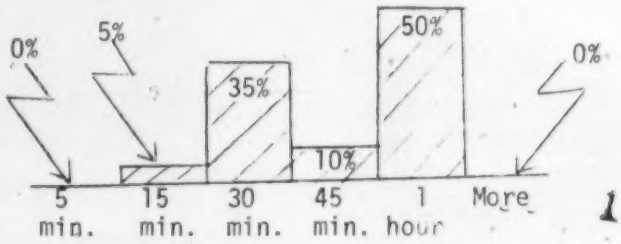


Figure 7

4. Did you understand the subject matter presented in the lesson?

Figure 8

5. Where on the scale below, would you place this method of instruction?

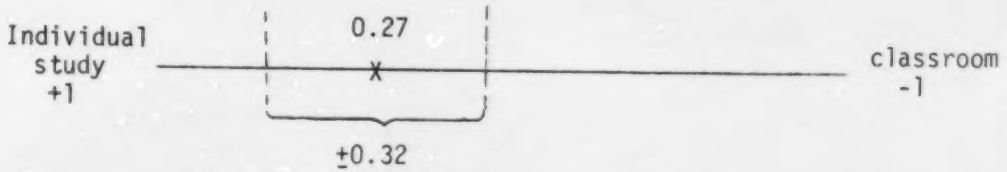


Figure 9

6. What kinds of instruction do you prefer? Rank the types listed below, from 1 to 5. Place 1 by your favorite and 5 by your least-liked type.

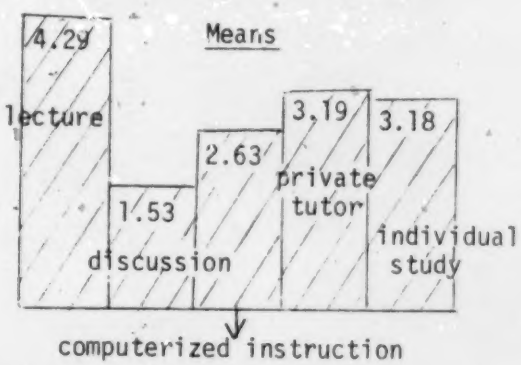


Figure 10

7. How well were you able to operate the terminal?

Figure 11

8. In your opinion, which of the following statements about the control keys are true and which are false. In each blank, mark a T if true and an F if false.

a. The keys are well spaced; I never missed my aim.

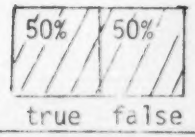
a. 

Figure 12

b. The labels on the buttons have little relationship to what you see when you push them.

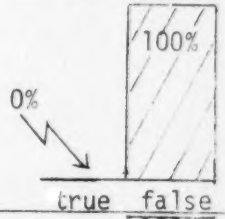
b. 

Figure 13

c. I forgot what you told me about what the buttons did and just pushed one of them more or less at random.

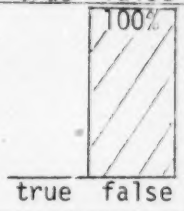
c. 

Figure 14

d. Pressing all those buttons was awkward.

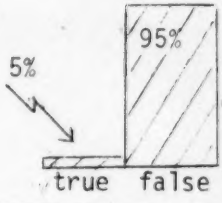
d. 

Figure 15

e. I would have preferred to figure out how to use the buttons myself, a lot of the orientation was not necessary.

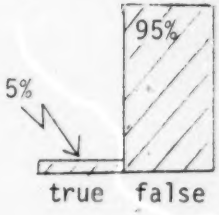
e. 

Figure 16

8. (continued)

f. There should be better explanation on how to use the buttons.

f.

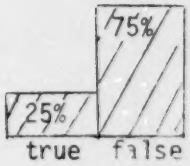


Figure 17

g. I enjoyed figuring out by myself when to push each button to receive instruction.

g.

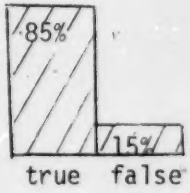


Figure 18

h. Having just rule, example, practice is too constraining. The system needs some more buttons that will allow further modifications in the instruction.

h.

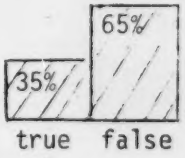


Figure 19

9. Did extraneous noise bother you?

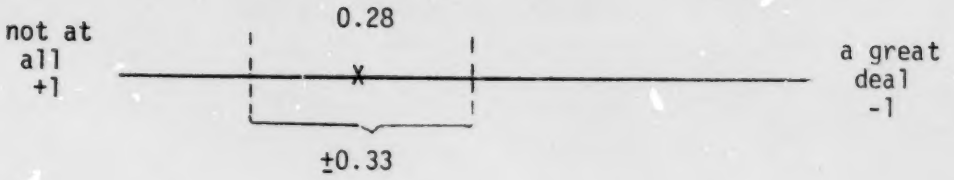


Figure 20

10. How do you feel about the room lighting?

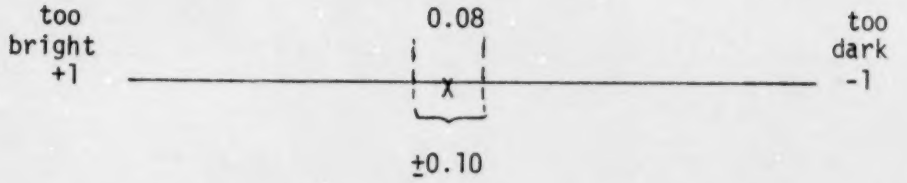


Figure 21

11. To what degree were you bothered with glare and/or reflection?

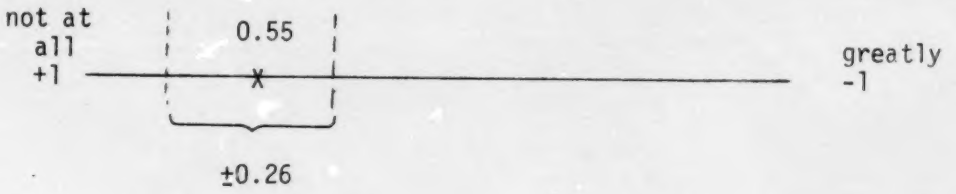


Figure 22

12. How much glare and/or reflection did you notice on the screen?

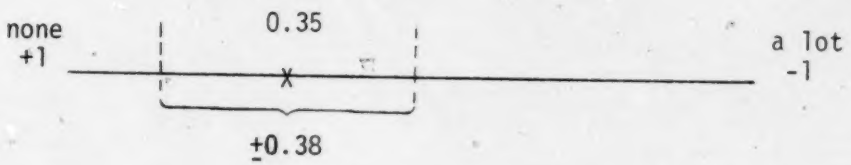


Figure 23

13. How well were you able to read material on the T. V. screen?

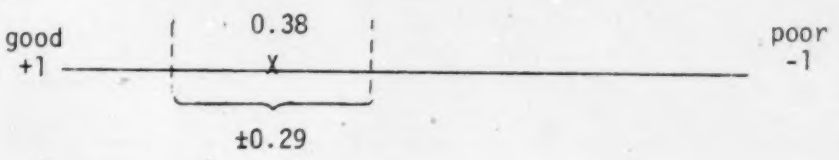


Figure 24

14. How did you feel about the brightness of the image on the screen?

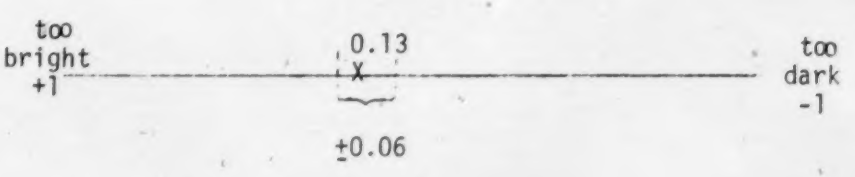


Figure 25

15. What are your feelings concerning the use of color in the material presentation?

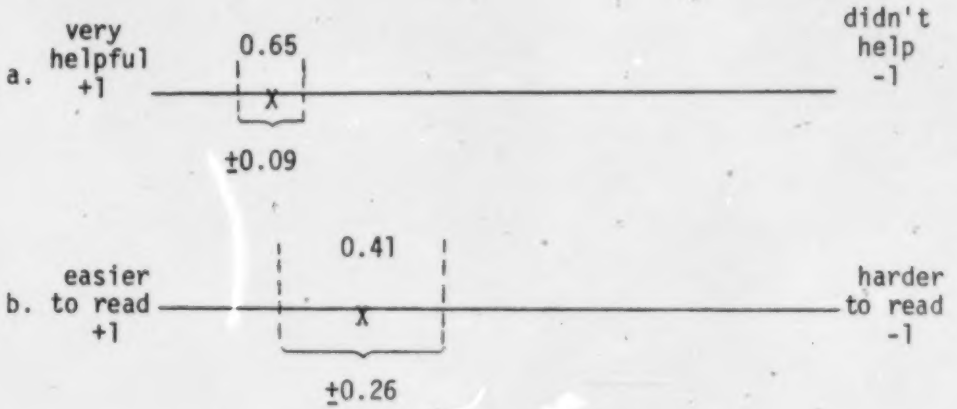


Figure 26

16. Which color did you like most? Least? Rank the colors listed below, from 1 to 5. Place 1 by your favorite and 5 by your least liked color.

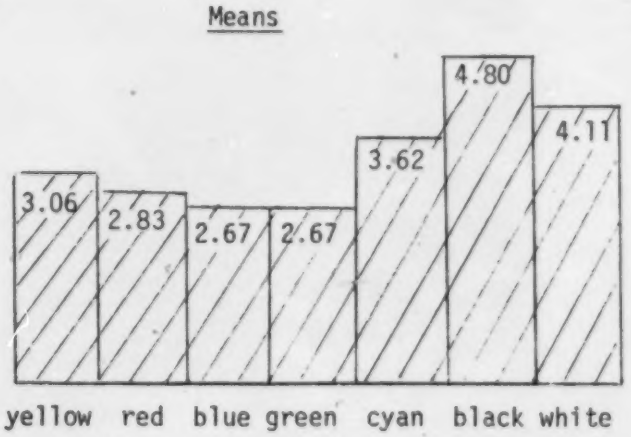


Figure 27

17. How did you feel about:

a. Your distance from the T. V.?

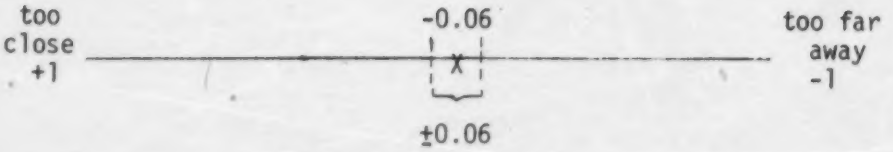


Figure 28

b. The T. V. height?

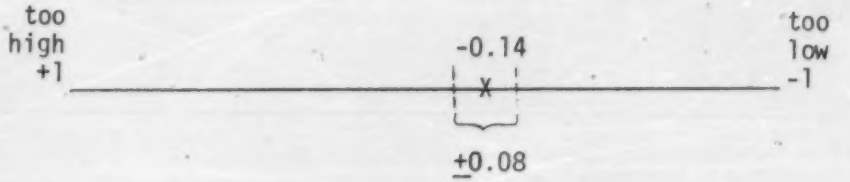


Figure 29

c. The height of the keyboard?

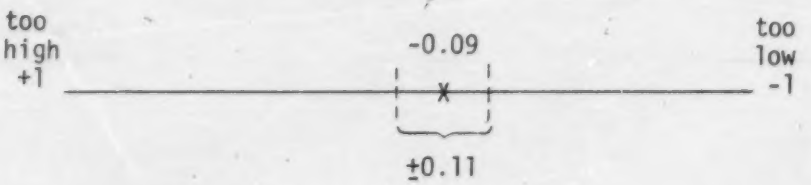


Figure 30

23

18. Do you have any difficulty in seeing? Check all that apply:

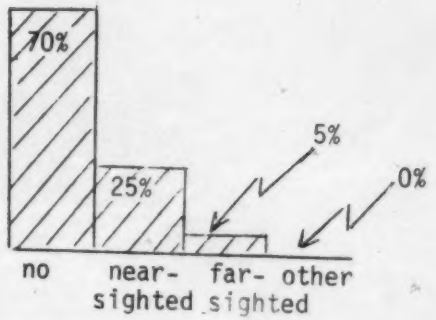


Figure 31

19. a. Do you have any color blindness?

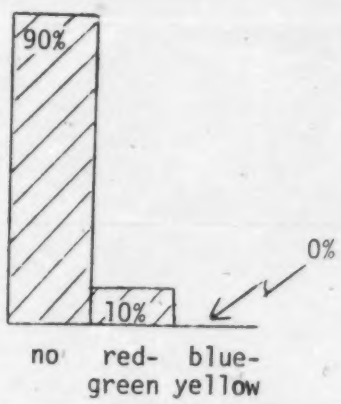


Figure 32

b. If so, did you have any trouble recognizing the color coding in the displays?

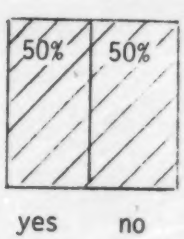


Figure 33

20. After you graduate from high school, what will you do?

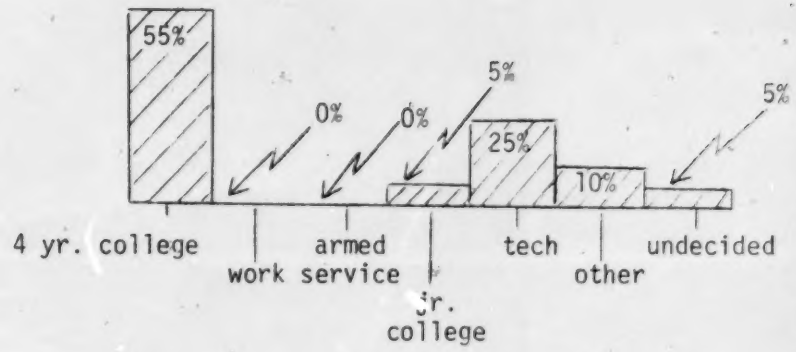


Figure 34

Appendix 1

Name _____

Student No. _____

OBSERVATION CHECKLIST

Intelligence	Bright	_____
	Average	_____
	Dull	_____
Activeness	Active	_____
	Average	_____
	Passive	_____
Grooming	Very neat	_____
	Average	_____
	Neglectful	_____
Attitude	Courteous	_____
	Bored	_____
	Inconsiderate	_____
	Positive	_____
	Negative	_____

Physical impediments _____

_____

Anything unusual (comments) _____

_____

So we may reimburse you for your participation in this evaluation, please provide the following information:

Name: _____

Address: _____

Appendix 2

QUESTIONNAIRE

Instructions: Please be candid in your ratings and answers. On rating scales, mark only one "X" on the line between the two adjectives according to your preference. Feel free to express specific comments in the space provided at the end of the questionnaire.

Course and Instruction

1. Did you enjoy this experience compared to other types of instruction?

very much -------+-------+-------+-------+------- not at all

2. From what you've seen of the terminal and the course, would you care to take an entire course this way?

A Math course?		An English course?	
yes	____	yes	____
maybe	____	maybe	____
no	____	no	____

3. On the average, how long do you think you would like to be at a terminal in one sitting?

(check one)

5 minutes _____
15 minutes _____
30 minutes _____
45 minutes _____
1 hour _____
more _____

4. Did you understand the subject matter presented in the lesson?

perfectly ------+------+------+------+------ not at all

5. Where on the scale below would you place this method of instruction?

classroom -----+-----+-----+-----+----- individual study

6. What kinds of instruction do you prefer? Rank the types listed below from 1 to 5. Place a 1 by your favorite type and a 5 by your least-liked type.

discussion	_____
lecture	_____
computerized instruction	_____
private tutor	_____
individual study	_____

7. How well were you able to operate the terminal?

perfectly -------+-------+-------+-------+------- not at all

8. In your opinion, which of the following statements about the control keys are true and which are false? In each blank, mark a T if true and an F if false.

_____ a. The keys are well spaced; I never missed my aim.

_____ b. The labels on the buttons have little relationship to what you see when you push them.

_____ c. I forgot what you told me about what the buttons did and just pushed one of them more or less at random.

_____ d. Pressing all those buttons was awkward.

_____ e. I would have preferred to figure out how to use the buttons myself, a lot of the orientation was not necessary.

_____ f. There should be better explanation on how to use the buttons.

_____ g. I enjoyed figuring out by myself when to push each button to receive instruction.

_____ h. Having just rule, example and practice is too constraining. The system needs some more buttons that will allow further modifications in the instruction.

Noise

9. Did extraneous noise bother you?

a great deal ----+-------+-------+-------+------- not at all

Lighting and Vision

10. How do you feel about the room lighting?

too bright -------+-------+-------+-------+------- too dark

11. To what degree were you bothered with glare and/or reflection?

not at all --------+-------+-------+-------+------- greatly

12. How much glare and/or reflection did you notice on the screen?

none -------+-------+-------+-------+------- a lot

13. How well were you able to read material on the TV screen?

good -------+-------+-------+-------+------- poor

14. How did you feel about the brightness of the image on the screen?

too bright -------+-------+-------+-------+------- too dark

Color

15. What are your feelings concerning the use of color in the material presentation?

a. very helpful ------+------+------+------+------ didn't help

b. harder to read ------+------+------+------+------ easier to read

16. Which color did you like most? Least? Rank the colors listed below from 1 to 5. Place a 1 by your favorite and a 5 by your least-liked color.

yellow	_____
red	_____
blue	_____
green	_____
cyan (turquoise)	_____
black	_____
white	_____

Distance and Height

17. How did you feel about your distance from the TV?

too close ------+------+------+------+------ too far away

Appendix 3

INSTRUCTIONS TO STUDENTS

Terminal Operation

This is a computer-assisted instructional system which is being developed for community colleges throughout the nation. Its official name is TICCIT, meaning Time-shared Interactive Computer-Controlled Information Television. You are here to help us evaluate the system.

What you are about to see are small parts of a freshman course in English composition. The objective is to teach you how to write good paragraphs. Two particular objectives are "How to write a purpose statement," and "How to compose a list of specifics to write a good paragraph." Just one idea will be presented, but the method of presentation will be different from anything that you are used to. Look at the special control buttons to the extreme right-hand side of the keyboard. Here is a summary sheet of these control buttons. (Hand out sheets.) These buttons allow you to control the order in which the material is presented. Notice especially the three buttons on the bottom row. The RULE button presents the basic idea. It does this in several possible forms. If you follow the RULE button with the EASY button, you will receive a conversational style of presentation. Just pressing the RULE button produces a rigorous formal definition. The next button to the right, the EG button, presents examples and

non-examples of the basic idea. Again, the EASY and HARD buttons allow you to modify the difficulty of the examples. The third button, the PRACTICE button, allows you to test yourself and see if you really understand by answering questions about the idea. If at any time you do not understand the material on the screen, you can obtain additional explanation by pressing the HELP button.

Please do not use any of the other special buttons, because they have not yet been implemented. Pressing them will just give you an error message to that effect.

Some of the displays have more than one page. When this occurs, you will see a capital "S" in the lower right-hand corner of the screen (except in certain cases where the "S" isn't implemented). We will try to indicate such incidences as they occur. To go on to the second page, press the space bar and then the ENTER key. In the case of practice exercises, type in your answer and then press the ENTER key.

Because certain parts of the computer instruction are not yet functioning, we will attempt to fill in where the computer is not yet operative (i.e., the answer--we will provide the appropriate answer to you verbally because the eventual answering system for this system is not operative yet). Attempt to figure things out on your own. If you are confused, we will help you.

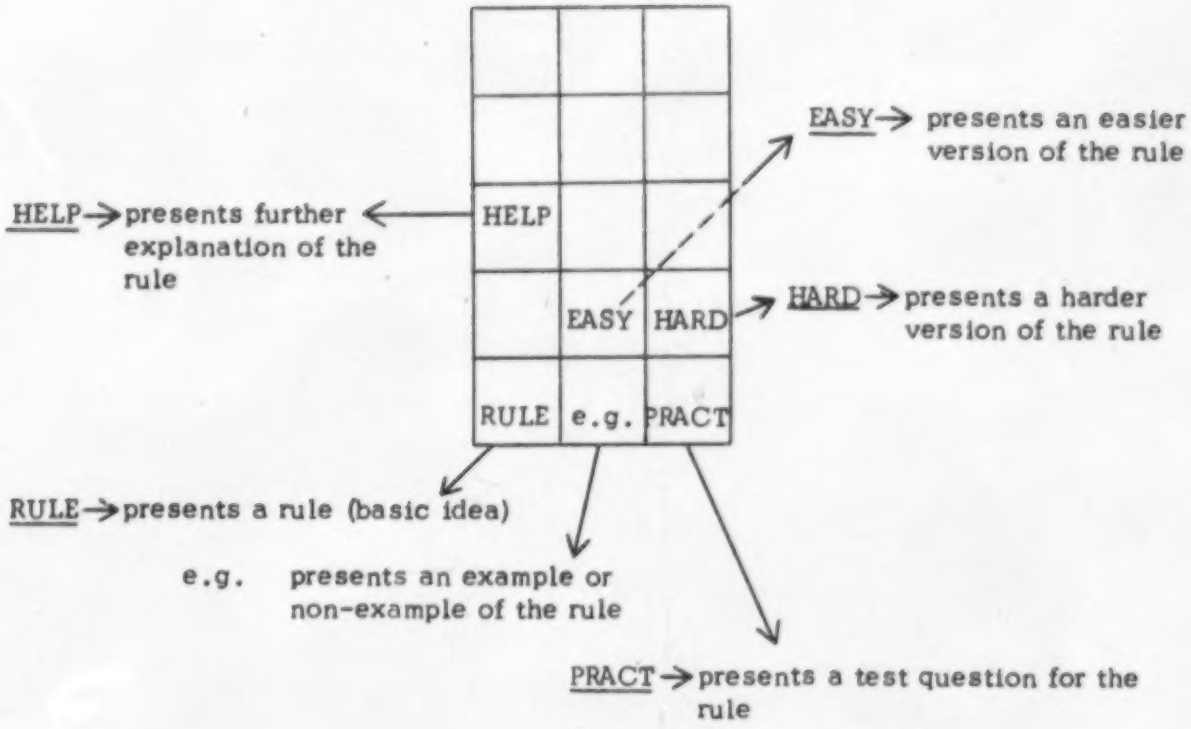
Reimbursement

You will be reimbursed at the rate of $2 per hour from the time you entered the door to the time you hand me a finished questionnaire that will be handed out later, pro-rated according to the time spent. It is not anticipated

Appendix 4

Summary of Keyboard Controls

1. Control buttons


HELP
EASY
HARD
RULE
e.g.
PRACT
EASY→ presents an easier version of the rule
HELP→presents further explanation of the rule
HARD→presents a harder version of the rule
RULE→presents a rule (basic idea)
e.g. presents an example or non-example of the rule
PRACT→presents a test question for the rule

2. Displays of more than . . . Capital "S" in lower right-hand corner of the screen. To get to second page (1) press spacebar, and (2) press the enter key.

3. To type in answers . . . Type answer, then press the enter key. on practice

that this evaluation will take a great deal of time. You will receive your reimbursement in the form of a check in the mail within ten days. Are there any questions?

Questionnaire

Now that you have finished the segments, we need to know your feelings concerning this experience. To do this, we ask you to complete this questionnaire. (Show questionnaire.) Put your name and address on the top of the questionnaire so that we will know where to send your reimbursement. (Hand out questionnaire.) Please read the instructions silently as I read them out loud. (Read.)

Any questions? When you are finished, please bring them to me. After I receive the completed questionnaire, you are free to leave.

Thank you. You may begin.